to frequency ν, then the maximum internal energy of the system is of the order of the quantum corresponding to that frequency, and it inspires the hope that some day we may obtain a model which will give an exact agreement. In other words, this calculation gives us good reason for believing that when more is known about the constitution of matter it will be found that a frequency ν is specially qualified for unlocking the quantity of energy $h\nu$.

The difficulty labelled 3 (*c*) above requires that there should be electrons with a wide range of periods in all metals.

It should be remembered that the phenomena of X-rays themselves, the verification of the theory of scattering, the theory of the crystal lattice, etc., have given us a wide extension of the field of usefulness of the wave theory. It is, of course, nowadays extremely difficult to keep abreast of all the work that is being done even in one field; consequently, different workers attach different values to the facts, and there are many opinions on the points discussed here. But as yet there is no reason for physicists to make any essential change in their attitude towards the wave theory, and in any case it does not conduce to clear thinking to use two mutually contradictory metaphors at the same time.

It is a curious fact that if Euclid does not deserve so much credit for his postulate of parallels as was formerly supposed, he may, on the other hand, lay claim to foreshadowing one feature of some modern views on light. For, according to his "Optics" (*circa* 280 B.C.), he thinks that there are gaps between the rays, that they are localised like the spread-out fingers of a hand; when the observer fails to perceive a small object like a needle lying directly in front of his nose, it is because the needle has got into one of the gaps between the rays.

Classical and Modern Education.[1]

By W. BATESON, F.R.S.

FOLLOWING that general misgiving as to our national system of education which, long felt by thoughtful men, found loud and continual expression during the war, Mr. Asquith, then Prime Minister, appointed (1916) Committees to consider the position of natural science and of modern languages respectively. After these Committees had reported, a third Committee was set up (1919) to investigate the position of classics in our educational system. The Report of this Committee, recently issued, is a comprehensive document, full of interesting materials, readable and scholarly, as from the character of the Committee might be expected. The history of classical teaching in the several parts of the United Kingdom, its rise and recent decline, are set out in detail, with an abundance of information never before collected. As to the main inference, no mistake is possible. The classical element in British education is disappearing, and will probably soon be gone altogether.

> In the Public Schools few boys are learning Greek, and even Latin, though still generally taught in middle and lower forms, tends more and more to be dropped higher up. None of the new Provided Schools has yet been able to develop a classical tradition and few of them teach Greek. . . . The danger with which we are faced is not that too many pupils will learn Latin and Greek, but that the greater part of the educated men and women of the nation will necessarily grow up in ignorance of the foundations on which European society is built.

The course of events has been exactly that which the defenders of compulsory classics at Oxford and Cambridge foresaw as the consequence of any weakening of front. Classics were maintained in education solely by the authority of the two old universities. Fearing the financial consequences of competition, they reduced the minimum demanded until it became ridiculous, the inevitable result being that Greek had to be dropped, with Latin soon to follow. The reformers were, of course, mostly persons who set no great store by classical education, but they were aided by many representatives of the humanities, who believed, or were persuaded, that the inherent value of classical training was so obvious that it would hold its own without protection. They forgot that, on their abdication, the decision would pass into the control of those who knew the classics only as a symbol of exclusion, with the Board of Education naturally well disposed towards any movement which could be represented as popular.

Probably emanating from that group of the reformers, there are passages in the Report which maintain an undertone of hope. Wonders have been achieved by a few resolute and devoted scholars in some of the most modern universities. This is "of good augury," and "with the enthusiasm born of free choice of subject" there may yet be a revival. Numerous recommendations on points of detail are suggested to this end. The regulations, especially those relating to "Advanced Courses" in secondary schools, and the examination schedules should not be weighted unduly against the classics. In every large district there should be at least one school where Greek teaching can be had and provision is made for boys and girls with literary tastes, and generally the Committee pleads that in every branch of educational administration classical education should be respected as a thing of great worth.

The value of the classics has never been better set forth. This part of the Report is admirable good sense, and approaches to eloquence as nearly as a Report to a Prime Minister can do. In the classics a man "obtains access to literature, both in prose and poetry, which in the judgment of many is absolutely the noblest in the world; but if that claim be not admitted, it is at least unique, inimitable, and irreplaceable. We have here a spiritual value not easily reckoned. . . ." Not merely are the works of antiquity "classic in the sense that they belong to the highest class of human achievement," but they have the peculiar merit of introducing the student to a world which is not our own, though presenting problems closely akin to ours, thus promoting a certain power of understanding and of judgment in fundamentals. The student has "attained this access to beauty and this power of understanding by means of a peculiar course of training which requires the exercise of many different powers of the mind, and forms a remarkable combination of memory-training, imagination, æsthetic appreciation, and scientific method. For better or worse, the study of the classics is quite a different thing from the learning of languages pure and simple." Even the merely verbal exercises start the "invaluable habit of thinking out the real meaning of words and phrases before attempting to translate them." The exposure of the inadequacy of translations is especially convincing. "Few people would seriously maintain that we can get 'all we want' out of an English translation of Victor Hugo or Goethe, or a French translation of Shakespeare or Burke."

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[1] "Classics and Education." Report of the Committee appointed by the Prime Minister to inquire into the Position of Classics in the Educational System of the United Kingdom. Pp. 308. (London: H.M. Stationery Office.) 2s. net.

The attitude of the Committee towards grammar is symptomatic of a welcome change. Hitherto the classical teacher has refused to put grammar anywhere but first. He would surrender nothing. By this pedantry thousands have been repelled. No one doubts that grammatical exercises are a fine educational instrument, but in comparison with the rest that classical education can do, grammar is such a small, poor thing. Had the scholastic world repented of this error when the warning came, the classics might have survived as the staple of at least a complete education. The remarks of the present Committee on methods of teaching are all that could be wished. It is advised that "great stress should be laid on the subject-matter and the historical background of the texts read, though not to the prejudice of exact training in the language." We may be thankful for this concession to common sense.

Probably it comes too late. Time was when modern languages, and especially science, were admitted grudgingly, and could be treated with scant respect. There is a sadly humbled tone now, and the classical apologist comes delicately before his judges. All he begs for is an equal chance; for instance, that in the "first examination" the requirements in other subjects should not be so exacting as to discourage the candidates from offering at least Latin as well as one modern foreign language, and that natural science should not be made compulsory.

It is true that the classics offer an access to beauty and give a power of understanding which nothing supplies so readily and so well, but the members of the Committee are sanguine men if they expect their recommendations to be adopted. The mind of the country is set on other things. "The civilisation of the modern Western world is grounded upon the ancient civilisation of the Mediterranean coast," as they rightly say in their exordium. The understanding of those who know nothing of these origins is hopelessly imperfect and starved. To this theme the Committee often recurs. The members have had the good fortune to meet with much evidence indicating a growing appreciation of the value of the classics, which is epitomised in striking passages of the Report. Mr. Mansbridge is quoted to the effect that a widespread demand for classical teaching may be expected amongst working people, who are greatly interested in the civilisation of Greece, "in spite," as he adds, "of deep-rooted prejudice against a nation which had such a sharp division of the classes"—a naive and significant illustration of the instructive value of classical experience. The social reformer may learn something by contemplating the peculiar and, as he holds, reprehensible system of Athens, a spectacle from which he naturally shrinks, as the feminist might from inspecting the dreadful example of the termite queens, or the hen hornbill plastered into the nest by her husband.

The Committee is under the impression that the scientific world especially concurs in its opinion. It is very doubtful whether the representatives of labour or of science who testified before them are truly representative of the mass with whom authority now rests. As the Committee remarks in another place, discussing the policy of the local education authorities, "it is unlikely that any body of ratepayers would consent to special financial provision for the encouragement of classics." It is: most unlikely. Let them raise the question in any place of common resort, or even, say, at a laboratory tea, and they will carry away no illusions about growing appreciation of the classics. They will find themselves in a world which cares not a jot that "all our modern forms of poetry, history, and philosophy" originated with the Greeks, and has only a scant curiosity as to whether Western civilisation is grounded on that of the Mediterranean or of some other coast. So complete is the break already that the younger students scarcely know that classical education can be seriously defended, and regard any tenderness for it as mere perversity and affectation. We are probably witnessing that rare and portentous event, a break in the continuity of civilisation. In the Press, in the arts, and, most singular of all, in learning of various kinds, the same phenomenon appears. The modern room of a picture gallery tells the same story as the pages of a scientific periodical. The new generation means to go a lot more easily than the last. Precision of language and finish are out of fashion and superfluous; as they would say, they have no use for them. A narrower range suffices. Any deep background of knowledge is only a source of perplexity. Richness and abundance are uncongenial to modern pragmatism. A simpler diet, consisting largely of ready-prepared and familiar substitutes, such as home provides, is preferable. All this is very curious and most interesting to observe. The world may become more contented, but it is likely to be duller, and that simultaneously with these changes a revival of interest in the classics can occur seems highly improbable.

The Report betrays a consciousness that the subject dealt with is one wider than the nominal problem of classical education, and the members of the Committee know that they are in reality pronouncing on a great social question. They are haunted by timidity and obsessed with the democratic nostrum of equal rights and opportunities; but, though fighting for their lives, they dare not make a firm stand. They should have declared boldly that learning, classical and natural, though comprising many parts, is one indivisible whole. Never was it so urgently necessary that the unity of the intellectual world should be maintained and strengthened. The natural and permanent division of society is between them and the rest. Instead of seeing in science a competitor, the classical advocates should have welcomed natural knowledge as an indispensable and essential part of complete education. Spontaneous curiosity is, as they truly say, the only safe foundation for the continuous life of any study; but curiosity is a function of active minds, which alone are entitled to the privilege of direction. Freedom of choice is a counsel of perfection; a mere vanity unless the choosers have themselves wisdom, and the knowledge by which choice must be guided. In default, the decision must be made by informed authority, and must be enforced by compulsion.

If the continuity of civilisation is to be preserved, there can be no question of abandoning the classics, but in the name of truth and advancement no less must science be presented to all who pretend to complete education. They must acquire a "widespread knowledge, however elementary, of the ancient world," and an equally widespread knowledge of the elements of natural truth. The rudiments of classics, of natural science, and of a modern language can be easily mastered by any boy of ability before he is seventeen. The feebler will no doubt drop behind. They will find their place below.

Notes.

A COMMITTEE has been appointed by the Home Secretary to re-examine, more particularly in the light of the further information which has become available since the inquiries of the Departmental Committees appointed in 1911, the question of the danger from the use of lead paints to workers in the painting trades, and the comparative efficiency and cost, and the effect on the health of the workers, of paints containing lead and leadless paints respectively; and to advise whether any modifications of the conclusions and recommendations of those Committees have become necessary. The members of the Committee are:—Sir Henry Norman, Bart. (chairman), Mr. G. Bellhouse, Dr. O. J. Kauffmann, Dr. T. M. Legge, Mr. A. E. Munby, Dr. A. Scott, and Mr. H. O. Weller. The secretary is Mr. C. W. Price, of the Home Office, Whitehall, S.W.1, to whom any communications should be addressed.

THE Air Ministry has accepted the offer of Sir Ernest Shackleton to carry out meteorological investigations and to gather topographical information during the forthcoming expedition in the *Quest*, and is affording all necessary assistance to the expedition in order that as complete information as possible may be collected. The expedition has been furnished with instruments and equipment necessary for carrying out meteorological observations, and the *Quest* has been constituted an official reporting ship of the Meteorological Office. The vessel has also been supplied with photographic apparatus and with kites similar to those employed in the investigation of the upper air over the Atlantic during the voyage of the s.s. *Montcalm* before the Transatlantic flight of the R34 in 1919. It is further proposed to take records of the temperature and pressure of the upper air by using a seaplane which is to accompany the expedition.

NEWS from the Mount Everest Expedition in Col. Howard Bury's dispatch to the *Times* is dated from Kharta, August 4. The northern and north-western sides of the mountain appeared to offer no practicable means of ascent, and the southern side is flanked by great precipices. In the hope of finding a way on the eastern side the expedition moved its base from Tingri to Kharta. The route was by Netsogu, Rebu, across the Doyala River to Chongpu, where a region of luxuriant vegetation was reached. The new camp appears to be in the Arun Valley and is placed on an old river terrace with fine views up and down the valley. Its altitude is about 12,300 ft. A mile below the camp begin the deep gorges of the Arun. Mr. Mallory and Mr. Bullock rejoined the expedition *en route,* bad weather having compelled them to give up their plan of trying to reach Kharta by the high pass north of Mount Everest. On August 2 they began the exploration of the eastern approaches of the mountain. The weather in August was bad, but better conditions were expected in September. Yet, in spite of these difficulties, more than 9000 miles of new country have now been mapped.

THE report of the Science Museum at South Kensington for 1920, which has recently been pub-